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CLAIMS

1. A heart assist device adapted for implantation into a patient, the device including:

a) an aortic compression means adapted, when actuated, to compress an aorta of a patient;

b) a fluid reservoir; and

c) a pump means adapted to pump a fluid from the fluid reservoir to the aortic compression means so as to actuate the aortic compression means at least partly in counterpulsation with the patient's heart,

wherein the fluid reservoir is adapted to be wholly positioned within the chest cavity of the patient.

2. A device as claimed in claim 1, wherein the fluid is a liquid.

3. A device as claimed in claim 2, wherein the liquid is water or saline.

4. A device as claimed in any one of claims 1 to 3, wherein the aortic compression means is adapted to be placed about the patient's ascending aorta.

5. A device as claimed in any one of the preceding claims, wherein the aortic compression means is curved along its length so as to substantially replicate the curve of the aorta adjacent to the aortic compression means.

6. A device as claimed in any one of the preceding claims, wherein the aortic compression means includes an elastic inflatable cuff adapted to at least partly encircle the aorta.

7. A device as claimed in claim 6, wherein the cuff is adapted to completely encircle the aorta.

8. A device as claimed in claim in claim 6 or 7, wherein the cuff is substantially C-shaped and includes two free ends that are adapted to overlap when the cuff is placed around the aorta.

9. A device as claimed in claim 8, wherein one of the free ends includes an elongated tongue adapted for suturing in an overlapping relationship to the other end to retain the device adjacent the aorta.

10. A device as claimed in any one of claims 6 to 9, wherein the cuff is a snug fit around the aorta of the patient.

11. A device as claimed in any one of the preceding claims, wherein the pump means and the fluid reservoir are provided in a fluid-filled substantially air-tight housing.

12. A device as claimed in claim 11, further including a pressure compliance means.

13. A device as claimed in claim 12, wherein the pressure compliance means forms part of the housing.

14. A device as claimed in claim 13, wherein the pressure compliance means is a substantially rigid portion of the housing downstream of the pump means, the portion being of sufficient rigidity so as to not deform inwardly during aortic compression nor deform outwardly in the absence of aortic compression.

15. A device as claimed in claim 13, wherein the pressure compliance means is a substantially flexible portion of the housing downstream of the pump means, the portion being of sufficient flexibility so as to deform inwardly during aortic compression and deform outwardly in the absence of aortic compression

16. A device as claimed in claim 15, wherein the flexible portion is adapted to be positioned in juxtaposition with a lung of the patient and deform outwardly to slightly compress the lung in the absence of aortic compression.

17. A device as claimed in any one of claims 6 to 16, wherein the cuff has a single inlet/outlet port.

18. A device as claimed in claim 17, wherein the port has a diffuser therein.

19. A device as claimed in claim 17 or 18, wherein the housing has an inlet/outlet port opening in fluid communication with the cuff inlet/outlet port.

20. A device as claimed in any one of claims 11 to 19, wherein the housing and the cuff are closely coupled.

21. A heart assist device adapted for implantation into a patient, the device including:

a) an aortic compression means adapted, when actuated, to compress the ascending aorta of a patient;

b) a liquid reservoir;

c) a pump means adapted to pump a liquid from the liquid reservoir to the aortic compression means so as to actuate the compression means, wherein the liquid reservoir and the aortic compression means are adapted to be positioned in close juxtaposition with one another within the chest cavity of the patient.

22. A device as claimed in claim 21, wherein the distance between the liquid reservoir and the aortic compression means is no more than 6 cm.

23. A device as claimed in claim 21 or 22, further including a wide bore liquid conduit between the liquid reservoir and the aortic compression device.

24. A device as claimed in claim 23, wherein the liquid conduit has a minimum cross sectional area of at least 1 sq cm.

25. A device as claimed in any one of claims 21 to 24, further including a pressure compliance means.

26. A device as claimed in claim 25, wherein the liquid reservoir, the pump means and the pressure compliance means are provided in an air-tight housing.

27. A device as claimed in claim 26, wherein the housing is fluid-filled and the liquid reservoir is a portion of the interior of the housing.

28. A device as claimed in claim 26 or 27, wherein the pressure compliance means is a flexible portion of the housing adjacent the liquid reservoir.

29. A device as claimed in claim 28, wherein the flexible portion is adapted for positioning in juxtaposition with the lung of the patient.

30. A device as claimed in any one of the claims 21 to 29, wherein the pump means is adapted for active compression of the aortic compression means and active decompression of the aortic compression means.

31. A device as claimed in any one of claims 21 to 29, wherein the pump means is adapted for active compression of the aortic compression means and passive decompression of the aortic compression means.

32. A device as claimed in any one of claims 21 to 30, further including a liquid pressure adjustment means between the aortic compression means and the liquid reservoir and in fluid communication with the aortic compression means and the liquid reservoir.

33. A device as claimed in claim 32, wherein the liquid pressure adjustment means is a remote reservoir positioned near the patient's skin that is adapted for the receiving or the removal of liquid therein via a needle though the skin.

34. A device as claimed in claim 32, wherein the liquid pressure adjustment means is a remote reservoir positioned in the chest cavity that is adapted for the receiving or the removal of liquid therein via a transcutaneous tube connected thereto.

35. A device as claimed in claim 32, 33 or 34, further including a means to sense the pressure in the liquid pressure adjustment means in the absence of aortic compression and alter the sensed pressure to a predetermined pressure.

36. An aortic compression means for use in a heart assist device, the aortic compression means including:

a) an elastic inflatable cuff adapted to be placed about the ascending aorta of a patient; and

b) a flexible, substantially inelastic, sheath adapted to extend around the cuff and at least assist in retaining it in position on the aorta.

37. A device as claimed in claim 36, wherein the aortic compression means is curved along its length so as to substantially replicate the curve of the aorta adjacent to the aortic compression means.

38. A device as claimed in claim 36 or 37, wherein the cuff is adapted to at least partially encircle the aorta.

39. A device as claimed in claim 38, wherein the cuff is adapted to completely encircle the aorta of the patient.

40. A device as claimed in any one of claims 36 to 39, wherein the cuff is substantially C-shaped and includes two free ends that are adapted to overlap when the cuff is placed around the aorta.

41. A device as claimed in claim 40, wherein one of the free ends includes an elongated tongue adapted for suturing in an overlapping relationship to the other end to retain the device adjacent the aorta.

42. A device as claimed in any one of claims 36 to 41, wherein the cuff is a snug fit around the aorta of the patient.

43. A means as claimed in any one of claims 36 to 42, wherein the sheath is a snug fit around the cuff.

44. A device as claimed in any one of claims 36 to 43, wherein the cuff has a single inlet/outlet port.

45. A device as claimed in claim 44, wherein the sheath has an opening complimentary to the cuff inlet/outlet port.

46. A device as claimed in claim 36 to 45, wherein the cuff is inflatable to an enlarged pressurised configuration to compressing the aorta and relaxes to a static configuration to relax the aorta.

47. A heart assist device including:

a) an aortic compression means adapted to be placed around the ascending aorta of a patient; and

b) an actuation means to periodically actuate the aortic compression means in at least partial counterpulsation with the heart,

wherein the aortic compression means and the actuation means are placed wholly within the chest activity of the patient.

48. A device as claimed in claim 47, wherein the aortic compression means and the actuation means are closely coupled.

49. A device as claimed in claim 47 or 48, wherein the aortic compression means is inflatable to compress the aorta and the actuation means includes a pump means adapted to pump fluid into the aortic compression means to inflate same.

50. A device as claimed in claim 49, wherein the actuation means further includes a fluid reservoir and a pressure compensation means.

51. A device as claimed in claim 50, wherein the pump means, fluid reservoir and the pressure compensation means are contained in a fluid-filled air-tight housing.

52. A device as claimed in any one of claims 47 to 51, wherein the pump means is an impeller adapted to drive fluid from the fluid reservoir and the aortic compression means.

53. A device as claimed in any one of claims 49 to 51, wherein the pump means is a fluid-filled sac adapted to be compressed to drive fluid from the sac to the aortic compression means.

54. A device as claimed in any one of claims 47 to 53, wherein the aortic compression means is an inflatable cuff adapted for positioning about the aorta of the patient.

55. A heart assist device adapted for implantation wholly into a bodily cavity of a patient, the device including:

c) an aortic compression means adapted, when actuated, to compress an aorta of a patient;

d) a housing with an exterior surface;

c) a fluid reservoir in the housing, the fluid reservoir having a flexible exterior surface forming part of the housing exterior surface; and

d) a pump means adapted to pump a fluid from the fluid reservoir to the aortic compression means so as to actuate the aortic compression means at least partly in counterpulsation with the patient's heart,

wherein the fluid reservoir flexible exterior surface is adapted to expand during aortic compression and constrict in the absence of aortic compression and is further adapted to be positioned substantially adjacent a flexible organ in the patient's bodily cavity.

56. A device as claimed in claim 55, wherein the bodily cavity is the thoracic cavity and the organ is the lung.

57. A heart assist device adapted for implantation into a patient, the device including:

a) an elastic inflatable cuff adapted, when inflated, to compress an aorta of a patient;

b) a fluid reservoir;

c) a means for pumping a fluid from the fluid reservoir to the cuff so as to inflate the aortic compression means at least partly in counterpulsation with the patient's heart; and

d) a means for adjusting the volume of fluid in the cuff in the absence of aortic compression.

58. A device as claimed in claim 57, wherein the volume adjusting means is disposed between the cuff and the reservoir and is in fluid communication with the cuff and the reservoir.

59. A device as claimed in claim 57 or 58, wherein the volume adjusting means is a remote reservoir positioned near the patient's skin that is adapted for the receiving or the removal of fluid therein via a needle though the skin.

60. A device as claimed in claim 57 or 58, wherein the volume adjusting means is a remote reservoir positioned in the chest cavity that is adapted for the receiving or the removal of fluid therein via a transcutaneous tube connected thereto.

61. A human or animal having a heart assist device according to any one of the preceding claims implanted therein.